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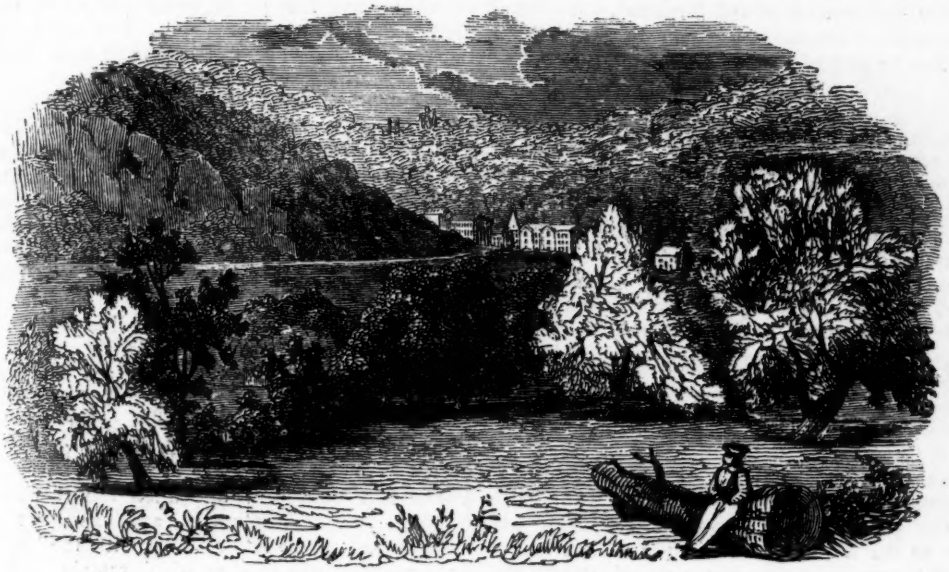
ON THE GENERAL LOCALITIES, NATURE, AND USES, OF MINERAL WATERS.



THE VALLEY AND BATH-HOUSE OF SCHLANGENBAD.

Drilled through the sandy stratum, every way
The waters with the sandy stratum rise;
Amid whose angles infinitely strained,
They joyful leave their jaggy salts behind,
And clear and sweeten as they soak along.

THUS does the poet Thomson explain one of the natural processes by which water is purified. In, and about London, we have an example of the filtration of water through sand. The clay and the gravel in this district extend 300 feet, and sometimes more, below the surface; under these is the sand. If we bore a hole through the clay and gravel, so as to get at the water in the sand, it will come filtering and purifying, through the latter substance; probably all the way from the chalk hills to the north and south of the valley in which the London basin of clay is situated. The clay above the sand, being very heavy, presses upon it, and forces the water above the surface in a jet, as soon as the opening is completed.

But it often happens that the water, instead of rising up through sand, by which it is filtered and purified, rises through soils containing iron, silex (or flinty earth), muriate of soda—or more properly chloride of sodium (common salt), sulphate of magnesia (Epsom salts), carbonate of lime (chalk, marble, or limestone), sulphate of lime (gypsum), sulphuretted hydrogen gas, carbonic acid gas, &c. One or more of these are retained by the water; and so affect its taste, colour, and chemical characters, that its effects on the animal system are various. Sometimes the effect is beneficial, at other times the contrary.

Water thus impregnated, has also a decided effect on many of the arts. The brewer, the paper-maker, the bleacher, and many others, are often subject to inconvenience, from the impurities contained in the waters they employ; so that it has occupied the chemist in many valuable researches, to ascertain the nature of the waters, to point out their uses in medicine, and to obviate their inconvenient effects in art. It is for this reason, that we treat of mineral or medicinal waters, separately from those more common forms of water which fit them for general domestic use.

Some mineral waters contain nitrogen and sulphurous acid gases, and a variety of substances in addition to those already mentioned. We shall, therefore, consider briefly the subject of medicinal waters according to their properties, and the leading ingredients which they contain, under the following heads:—1. The *Acidulous*, or *Carbonated*; 2. The *Sulphurous*; 3. The *Chalybeate*; 4. The *Saline*.

1. The carbonated waters are such as contain a considerable quantity of carbonic acid. Soda water (as it is called) consists chiefly of carbonic acid gas and water, the gas being mechanically combined with the water under great pressure. This gas imparts to water a sharp and somewhat acid taste (hence the term acidulous); and it presents a sparkling appearance when poured from one vessel into another, arising from the particles of the acid passing into the gaseous form and escaping from the water. This escape of gas always ensues when the water is exposed to the air; it may be liberated in greater quantity by heating the water, and boiling expels it altogether.

The presence of free carbonic acid in water may be detected by adding lime-water to it, as a cloudiness immediately ensues. The rationale of this is as follows: lime is prepared by burning chalk (or any carbonate of lime), at a red heat, for several hours; by this means the greater portion of its carbonic acid is expelled, and the resulting lime is soluble, to a certain extent, in water. Now if lime-water be added to water containing carbonic acid, (the attraction between lime and carbonic acid being stronger than that between carbonic acid and water,) the gas will quit the water to unite with the lime, and the latter will

be reconverted into chalk, which is less soluble in water than lime, hence the cloudiness in the mixture. Now, although chalk, or carbonate of lime, is scarcely soluble in water, yet water containing carbonic acid dissolves it easily, so that the cloudiness in the above mixture may be removed by adding to it more carbonic acid, or more water containing carbonic acid. Hence many hard waters and mineral waters contain much carbonate of lime, because the carbonic acid in the water imparts a soluble property to the latter.

The most celebrated carbonated springs are those of Seltzer, Pyrmont, Spa, and Carlsbad, but they all contain saline matters in addition to the carbonic acid. A wine pint of Spa water afforded :—

Carbonic acid	13 cubic inches.
Carbonate of soda	1·5 grains.
Carbonate of magnesia	4·5 „
Carbonate of lime	1·5 „
Muriate of soda	0·2 „
Oxide of iron	0·6 „

The same quantity of Pyrmont water yields 26 cubic inches of carbonic acid, and 30 grains of saline matter, *i. e.*, 10 grains of magnesia, 5·5 of Epsom salts, and 8·5 of sulphate of lime. The same quantity of Seltzer water contains 29 grains of saline matter, 17 of which are common salt, and yields 17 cubic inches of carbonic acid. The Carlsbad waters give only 5 cubic inches of gas from a wine pint, but contain 10 or 12 different salts.

Dr. T. Thomson says, that the Spa waters may be termed either acidulous or chalybeate, for they are a combination of both. Their effect is stimulating, and they promote the secretions, especially with respect to the kidneys and the skin. The general effect of the carbonated waters is stimulant, and they are even capable of producing a certain degree of transient intoxication; they are also useful in bilious affections, and as an agreeable drink in fevers, but are injurious in cases of flatulency or indigestion.

Many of our readers have doubtless read that very entertaining work, *Bubbles from the Brunnens of Nassau*, in which the properties of some of the German waters are described with much graphic power, and no little humour. The author, Sir F. Head, visited the Seltzer spring among others. This spring is situated at the village of Nieder-Selters, in Nassau, a place which he describes as a "world of stone-bottles." The fact is, that the water of the "brunnen" or "bubbling brook" of Selters, or Seltzer, is sent in stone-bottles to every part of Germany, to Paris, London, the East and West Indies, &c., and as the whole supply is obtained from one spring, a busy scene necessarily presents itself in the vicinity of the well. The opening of the well is about five feet square, and the bottles are filled by being placed in a crate or frame, (which will hold seventy bottles,) and lowered into the well. The air is expelled, and the bottles filled with water in about twenty seconds; the crate is then drawn up and removed to one side; immediately after which another crate, suspended from another arm of the same crane, is lowered and filled in the same manner. In this way three crates are engaged at once; one being lowered into the well, another being supplied with empty bottles, while the filled bottles are being removed from the third. The processes are continued with great rapidity. Two men place corks in the bottles, two more hammer them down, women and girls carry the bottles (one hanging on each finger of each hand) to a bench, where the corks are cut off close to the bottle; the bottles then pass into the hands of women who tie white leather over the corks, two men dip the corks, leather and all, into melted resin, two others stamp the seal of the Duke of Nassau upon the soft resin, and finally the bottles are stored in a warehouse. All this is done in an incredibly short time, and the process is continued from three in the morning until seven in the evening, after which hour the inhabitants may help themselves. This privilege is granted to them by the duke, to whom the well belongs, and to whose ancestors it was sold for a butt of wine. The enormous quantity of 1,295,183 bottles were filled for exportation in 1832, besides half a million for private consumption. Sir F. Head saw twenty-five bins of bottles, each four yards broad, six deep, and eight high, all waiting to be filled. The duke gives sixpence per hundred for having the bottles filled, and sells them, when filled, for thirteen florins per hundred.

With respect to the effects of this water the author remarks. "The best analysis I can offer of the Seltzer water, is the plain fact that the inhabitants of the village, who have drunk it all their lives, are certainly by many degrees, the healthiest and ruddiest looking peasants, I have anywhere met with in the dominions of the Duke of Nassau." He remarked, that the taste of the water when drunk at the well, had more of the chalybeate quality (which we shall explain presently) than when drunk from the bottle.

2. *Sulphurous Waters.*—These are marked by a peculiar fœtid odour, resembling that of rotten eggs, which they owe to the presence of sulphuretted hydrogen in the water; indeed this gas is formed during the putrescence of eggs. It consists of sulphur and hydrogen, but when mixed with water, (which largely dissolves it,) and exposed to the air, the oxygen of the latter unites with the hydrogen of the gas, and the sulphur which remains is deposited as a yellow sediment.

Waters of this kind are distinguished by rendering metallic silver black, or causing a brownish-black precipitate with a solution of acetate of lead, or nitrate of silver. This arises from the union of the sulphur with the metallic silver or lead. It acts in this way on several of the metallic oxides, an amusing instance of which we will relate. A nitric solution of bismuth, mixed with a small portion of muriatic acid, when diluted with water, throws down a beautiful subtile white milky powder; this being collected and washed with cold water, appears in minute scales of a pearly lustre, and constitutes the *Pearl Powder* of the perfumers. In this state it is employed as a cosmetic by those ladies who are dissatisfied with the natural complexion of their skin. One of these ladies went to bathe in a sulphurous water bath, and and came out as one of "Ethiop's sable daughters," the sulphuretted hydrogen having blackened the oxide of bismuth of her "genuine" Pearl Powder.

The sulphuretted hydrogen gas may be expelled from these waters by the application of heat.

Among the most noted sulphurous springs are those of Aix-la-Chapelle, Harrowgate, and Moffat. One wine gallon of Harrowgate water contains :—

Sulphuretted hydrogen...	6· 4	cubic inches.
Carbonic acid	5·25	
Nitrogen	6· 5	
Carburetted hydrogen ...	4·65	
	22· 8	cubic inches of gas.
Common salt	735· 0	grains.
Muriate of lime	71· 5	
Muriate of magnesia.....	43· 0	
Bicarbonate of soda	14·75	
	864·25	grains of saline matter.

There are about fourteen wells at Harrowgate, all possessing mineral qualities, differing somewhat from

one another, but possessing a general sulphurous character.

Sir F. Head, in the work before quoted, speaks of a powerful sulphurous spring at Langen-Schwalbach, in Nassau. This spring was, in the time of the Romans, in the heart of an immense forest; but as the virtues of the water became gradually known, huts and hovels were erected, which afterwards gave way to houses, and, lastly, to a town. The spring is about eighteen inches below the ground. The water contains a little iron, but is principally sulphurous, and a suffocating gas ascends from it; yet, notwithstanding this circumstance, the Jews who live in the village constantly drink, cook, and wash with the water.

In Mrs. Trollope's *Belgium and Western Germany*, the waters of Aix-la-Chapelle are thus alluded to:—

The hot springs are abundant, and held to be highly salubrious. The one which is of the highest temperature, rises at Borcette, a little town perfectly distinct from Aix, but close to it. This Borcette spring is much too hot for the hand to endure, but I doubt its being actually boiling, as I have heard stated; we saw, however, several women take pails of it for their washing, and were told that they never find it necessary to use any other in the process. The large smoking caldron, which is open in the middle of the street at Borcette, has a very strange appearance, the vapour rising and spreading up and down it to a considerable distance.

The general effect of sulphurous waters upon the system are of a cleansing character. In all eruptions, diseases of the skin, ulcers, &c., they are found to be valuable when used as a bath, and when used as a drink they stimulate the system.

3. *Chalybeate Waters*,—are those which contain iron in such quantity as to form one of their leading ingredients. The term chalybeate is derived from the Latin, *chalybs*, signifying "hard iron," or "steel." In these waters the iron is in the state of an oxide, which is by itself insoluble, but it is generally in union with carbonic acid, or sometimes with muriatic or sulphuric acid. When water of this kind is freely exposed to the air, so much of the oxide of iron unites with an additional portion of the oxygen of the air, as to form an insoluble per-oxide of iron. In order to effect this, the oxide quits the acid with which it is united; this is the cause of the brownish or reddish-yellow deposit observed at the sides and bottom of such springs.

Chalybeate waters are known by turning black when mixed with an infusion of galls. Galls and sulphate of iron are two of the ingredients in ink, and this kind of water has an inky astringent taste. The chalybeate springs contain other ingredients besides the carbonate of iron, such as those which are found in saline waters.

The most celebrated chalybeate waters in England are those of Tunbridge, Brighton, and Cheltenham. The waters of Tunbridge have a temperature of about 50°: the supply is not great, and is in some measure dependent on the weather, the smallest supply being about a quart, and the greatest about two and a half gallons, per minute. The effect of these waters is of a stimulating and strengthening character. The other chalybeate springs in England have properties very similar to the above. Dr. Thomson has recently described a spring at Vicar's Brig, in Perthshire, which he considers the strongest chalybeate water in existence. It is four times as strong as the Moffat water, and is too powerful to be drunk without dilution, but is used by the country people to heal cuts and bruises.

At Langen-Schwalbach are three springs, which Sir F. Head describes, and which may be considered as chalybeate, although they contain also much carbonic acid. There are three brunnens,—the Pauline, the Wein, (wine,) and the Stahl, (steel,) which attract visiters in great numbers. Sir F. Head was recommended to take three glasses of the water at six in the morning; to bathe at ten o'clock (taking two more glasses on emerging from the bath); and, finally, three glasses at five in the evening. The water is so thickly impregnated with oxide of iron, that the colour is quite red and muddy, but it imparts a vigour and strength to the system. The bathing dresses which have been frequently immersed in this water, are stained of a deep red colour.

MY MOTHER, I REMEMBER THEE!

Blest mother! I remember thee, from early childhood's hour,
When first my heart awoke to feel maternal love's deep power;
When not a transient tear could dim the smile of infant bliss,
That was not dried beneath the warmth of a mother's fervent kiss.

Ah! yet the prayer I learned to lisp at twilight by the knee,
Is clear upon the deep-wrought page of hallowed memory!
And those soft tones that rose to heaven from out thy swelling breast,
They seem to sound upon my ear, though thou art gone to rest.

Blest mother! I remember thee, from youth's fresh, buoyant day;
A star thou wert to guide my feet, of pure and constant ray:
Thy love possessed a charm beyond the light of pleasure's beams,
And 't was thy counsel that forbade my trust in earthly dreams.

And I remember a soft hand that smoothed my aching head,
A tearful, guardian eye, that watched beside my curtained bed;
The careful step, the soothing draught thy kindness had prepared,
And all the tokens of that love thy orphan child once shared.

Blest mother! I remember thee, as guide, companion, friend!
When years mature had taught my heart life's blessings and their end;
When I had learned to share thy griefs, to shed the tear for thee,
Who in my wayward days had turned to pray and weep for me.

'T was mine to cheer thy widowed heart with all a daughter's love,
And lift thy sinking spirit up to brighter scenes above;
To scatter in thy lonely path the flowers which kindness weaves,
And bind around thy temples fair affection's myrtle leaves.

Blest mother! I remember thee, (alas! how sad the spot
On memory's page, which even now the tear of grief must blot!)
When first the blight of fell disease passed o'er thy constant heart,
And on thy brow, with death's pale hand, 't was written, 'We must part!'

But not a murmur mingled then with faith's assurance given,
And not a fear passed with thee through the darksome vale to heaven;
No! God's own rod and staff were there, nor could I wish thy stay,
When angels beckoned thee from earth, and all its ills away.

Blest mother! I remember thee, when on thy sable bier,
And followed by an orphan train, which stranger hands must rear;
When laid within thy narrow bed, where now the green turf grows,
While we were left alone to stem the tide of human woes.

Yet not *alone*, for One there is, our Father in the sky,
Who stoops to make our cause his own, who listens to our cry;
Upon his arm our strength was stayed, his hand hath been our guide,
And He who gives the ravens food, for us will still provide.

Blest mother! now I think of thee, as one amid that throng
Who chant before the throne of God 'their everlasting song;'
In midnight dreams thy angel form around my couch appears,
And oft thy hand seems stretched again, to wipe away my tears.

When gazing at the shining stars, their fixed and holy light
Recalls thine own unwavering faith, and thy example bright;
And in the firmament of heaven, a star thou 'lt ever shine,
With beams more beautiful and bright—a lustre all divine.

E. C. S.

ENGLAND IN THE OLDEN TIME.

No. IV.

Games with a Ball.

There are but few exercises more delightful and invigorating than games played with a ball in the open air. Every muscle is exerted,—the eye is accurately directed towards a particular spot,—and the attention of all the players is fully roused. Unlike many other games, it is seldom that wrangling or churlish feelings are engendered by the course of the sport; and there can be no doubt that the physical powers are strengthened by the exercise.

One of the earliest kinds of ball-play was, in all probability, that of *catch-ball*, in which two or more players toss a ball alternately from one to another: this requires but little bodily exertion, and used to be practised by females as well as by males.

When the ball, instead of being merely tossed from one to another, is struck, we enter upon a great variety of games, which have, in one form or other, lasted to the present day. A game of this kind, called *palm-play*, used to be practised in France. This exercise consisted in receiving a ball thrown by another player, and driving it back again with the palm of the hand. In former times they played with the naked hand, then with a glove, which in some instances was lined: afterwards they bound cords and tendons round their hands to make the ball rebound more forcibly; hence probably was the idea of *racket* obtained.

In the sixteenth century tennis-courts were common in England, and their establishment countenanced by the example of the monarchs. Henry the Seventh was a tennis player; for in a MS. register of his expenditures made in the thirteenth year of his reign, and preserved in the Remembrancer's Office, this entry occurs:—"Item, for the king's loss at tennis, twelvepence; for the loss of balls, threepence." His son, Henry the Eighth, was, in the early part of his reign, also much attached to this diversion. This propensity, to use the words of Hall, "being perceived by certain craftie persons about him, they brought in Frenchmen and Lombards to make wagers with hym, and so he lost muche money; but when he perceyved theyr crafte, he eschued the company and let them go." The game seems to have consisted in this: a line was stretched across the middle of the court, and the players, standing on either side with their rackets ready to receive the ball, endeavoured to strike it so as to go over the dividing line.

Fives, or hand-tennis, seems to have derived its name from the number of competitors on each side. In 1591, when Queen Elizabeth was entertained at Elvetham in Hampshire, by the Earl of Hertford,—

After dinner, about three o'clock, ten of his lordship's servants, all Somersetshire men, in a square greene court before her majesties windowe did hang up lines, squaring out the forme of a tennis-court, and making a cross line in the middle; in this square they (being stripped out of their dublets) played five to five with hand-ball and cord as they tearme it, to the great liking of her highness.

Balloon-ball, or *wind-ball*, was a game formerly played. This was a large ball made of leather and filled with air. It was struck by the hand, or by a bracer of wood which covered the hand and the lower part of the arm.

Stool-ball was a game which Strutt thus describes:

I have been informed that a pastime called *stool-ball* is practised to this day in the northern parts of England, which consists in simply setting a stool upon the ground, and one of the players takes his place before it, while his antagonist, standing at a distance, tosses the ball with the intention of striking the stool; and this it is the business of the former to prevent by beating it away with the hand, reckoning one to the game for every stroke of the ball; if, on the contrary, it should be missed by the hand and touch the stool, the players change places. I believe the same also happens if the person who threw the ball can catch and retain it when driven back, before it reaches the ground. The conqueror at this game is he who strikes the ball most times before it touches the stool. Again, in other parts of the country, a certain number of stools are set up in a circular form, and at a distance from each other, and every one of them is occupied by a single player; when the ball is struck, which is done, as before, with the hand, every one of them is obliged to alter his situation, running in succession from stool to stool, and if he who threw the ball can regain it in time to strike any one of the players, before the latter reaches the stool to which he is running, he takes his place, and the person touched must throw the ball, until he can, in like manner, return to the circle.

This differs but very little from the game of *rounders*, which is much played at the present day in the west of England.

Trap-ball, as it was formerly played, differed from the plan pursued at the present day. The annexed engraving represents the form of the trap, taken from a MS. of the fourteenth century. There seems to be

this advantage in the old method over the modern one, that the player need not stoop to strike the trap, since it is elevated considerably from the ground. Rustics have a mode of preparing a rude trap, by making a round hole in the ground, and, by way of a lever, place a flat piece of wood in an inclined position, one half in the hole with the ball upon it, and the other half out of it: the elevated end being struck smartly with the bat, occasions the ball to rise to a considerable height, and all the purposes of a trap are thus answered.

It is usual in playing the game, to place two boundaries at a given distance from the trap, between which it is necessary for the ball to pass when it is struck by the batsman, for if it falls withoutside of either, he gives up his bat and is out; he is also out if he strikes his ball into the air, and it is caught by one of his adversaries before it grounds; and again, if the ball, when returned by the opponent party, touches the trap, or rests within one bat's length of it: on the contrary, if none of these things happen, every stroke tells for one towards the striker's game. In Essex the game is frequently played with a stout round cudgel, instead of a bat, which renders the striking of the ball more difficult. When the player has struck his ball, he calls aloud for a certain number, one or more, of *scores*, the object of which is as follows:—the opposing party bowls or throws the ball towards the trap; when the ball stops, the distance from it to the trap is measured in

cudgels' lengths; if the number of these lengths equals or exceeds the score called for by the player, he adds those scores towards his game; but if they are less, the player is out. This is an excellent feature in the game, because the player regulates the number of *scores* for which he calls out, by his estimate of his opponent's skill in sending the ball near the trap.

There is another game called *tip-cat*, in which a small piece of wood, called the *cat*, answers the purpose of both ball and trap. It is about six inches long and two inches diameter at the middle, from whence it tapers off to a point at each end, presenting the appearance of a double cone. When this cat is laid on the ground, a blow of the bat at either side of the centre will send it spinning up into the air; it is then struck with the bat, as at trap-ball, and any regulations as to the mode of playing the game may be adopted at pleasure.

There were numerous games under the names of *foot-ball, bandy-ball, goff, club-ball, pall-mall,* &c., in which a ball was struck from one place to another; but it is not necessary to describe them all separately, since two or three of them were very similar. Goff is frequently played at present in the following manner. It is performed with a straight bat, usually made of ash, about four feet and a half in length, and curved at the bottom. The ball is small, but exceedingly hard. There are generally two players, each of whom has his bat and ball. The game consists in driving the ball into certain holes made in the ground, he who achieves it the soonest, or in the smallest number of strokes, obtains the victory. The goff-lengths, or the spaces between the first and last holes, are sometimes extended to the distance of two or three miles; the number of intervening holes appears to be optional, but the balls must be struck into the holes, but not beyond them. When four persons play, two of them are sometimes partners, and have but one ball, which they strike alternately, but every man has his own bat.

Goff, and another game very similar to it, called *pall-mall*, were favourite games among the nobility in the seventeenth century. In the latter game a ball was struck with a mallet or bat through a high arch of iron, and the game was won by the player who could do it with the fewest blows. Charles the Second and his courtiers were in the habit of indulging in this sport in the walk in St. James's Park, which took the name of *mall* from this circumstance; it is also probable that the street which runs parallel to that walk acquired the name of Pall-Mall from the same circumstance. The name was originally Pale-Maille.

The game of *ring-ball* was played as follows. A long alley or playground was selected, and a ring was fastened into the ground at an equal distance from the sides of the alley, but much nearer to the top than to the bottom of the ground, and through this ring it was necessary for the ball to be passed in its progress. The ring was made to turn with great facility upon a swivel, and the two flat sides were distinguished from each other. If the ball passed through the one, it was said to be lawful and the player went on; but if through the other, it was declared to be unlawful, and he was obliged to beat the ball back until such time as he caused it to pass on the lawful side; this done, he proceeded to the bottom of the ground, where there was an arch of iron through which it was also necessary for the ball to be passed, and then the game terminated:—he who executed his task with the smallest number of blows to the ball, won the game. Our second figure, taken from a MS. of the thirteenth century, represents a man playing at *club-ball*, which probably did not differ much from *ring-ball*.

There is a Cornish game called *hurling*, which is attended with much excitement and bodily exertion by the players. Carew, who wrote a *Survey of Cornwall*, more than two centuries ago, thus describes this game:—

Hurling taketh his denomination from throwing of the ball, and is of two sorts,—in the east parts of Cornwall to *goales*, and in the west to the *country*. For hurling to *goales*, there are fifteen, twenty, or thirty players, more or less, chosen out on each side, who strip themselves to their slightest apparel, and then join hands in ranke one against another. Out of these rankes they match themselves by payres, one embracing another, and so passe away, every of which couple are especially to watch one another during the play; after this they pitch two bushes in the ground, some eight or ten feet asunder, and directly against them, ten or twelve score paces off, other twain in like distance, which they terme *goales*, where some indifferent person throweth up a ball, the which whosoever can catch and carry through his adversaries goale, hath wonne the game. But herein consisteth one of Hercules his labours, for he that is once possessed of the ball, hath his contrary mate waiting at inches and essaying to lay hold upon him, the other thrusteth him in the breast with his closed fist to keep him off, which they call *butting*. For hurling to the *country*, two, three, or more parishes, agree to hurl against two or three other parishes. The matches are usually made by gentlemen, and their goales are either these gentlemen's houses, or some towns or villages three or four miles asunder, of which either side maketh choice after the nearnesse of their dwellings. When they meet there is neyther comparing of numbers nor matching of men, but a silver ball is cast up, and that company which can catch and carry it by force or sleight to the place assigned, gaineth the ball and the victory. Such as see where the ball is played, give notice, crying "ware east," "ware west," as the same is carried. The hurlers take their next way over hilles, dales, hedges, ditches; yea, and thorow bushes, briars, mires, plashes, and rivers whatsoever, so as you shall sometimes see twenty or thirty lie tugging together in the water, scrambling and scratching for the ball.

Strutt says, that at about the year 1775, parties of Irishmen used to meet in the fields at the back of the British Museum (now occupied by Montague Place, &c.) and play at hurling to goals. Instead of throwing the ball with the hand, they employed for that purpose a kind of bat, which was flat on both sides and curved at the end.

Foot-ball is played by two parties, consisting of an equal number of competitors, who take the field, and stand between two goals, placed at a distance of eighty or a hundred yards from each other. The goal is usually made with two sticks driven into the ground, about two or three feet apart. The ball,

which consists usually of a horse's bladder blown and cased with leather, is thrown into the midst of the ground, and the object of each party is to drive it through the goal of their antagonists, which being achieved, the game is won. The abilities of the players are best displayed in the attack and defence of the goals: sometimes when the players become excited, they so far lose sight of friendly feelings as to commence kicking each other's shins, in contesting at the goals.

Of the noble game of *cricket* we need say but little, partly because it is so universally known, wherever a free patch of green-sward is to be met with, and partly because it is our object to describe those games which were more in vogue in "the olden time" than at present. Cricket was probably never more prevalent in England than at the present day.

There are other ball-games which our younger readers will easily call to mind, but we cannot here devote space to them, for the reasons just assigned with reference to cricket.

STRUGGLE BETWEEN AN EAGLE AND A SALMON.

That the eagle is extremely destructive to fish, and particularly so to salmon, many circumstances would prove. Eagles are constantly discovered watching the fords in the spawning season, and are seen to seize and carry off the fish. Some years since, a herdsman, on a very sultry day in July, while looking for a missing sheep, observed an eagle posted on a bank that overhung a pool. Presently the bird stooped and seized a salmon, and a violent struggle ensued; when the herdsman reached the spot, he found the eagle pulled under water by the strength of the fish; and the calmness of the day, joined to his drenched plumage, rendered him unable to extricate himself. With a stone the peasant broke the eagle's pinion, and actually secured the spoiler and his victim, for he found the salmon dying in his grasp.

When shooting on Lord Sligo's mountains, near the Killeries, a gentleman says he heard many particulars of the eagle's habits and history from a gray-haired peasant who had passed a long life in these wilds. The scarcity of hares, which here were once abundant, he attributed to the rapacity of those birds; and he affirmed, that when in pursuit of these animals, the eagles evinced a degree of intelligence that appeared extraordinary. They coursed the hares, he said, with great judgment, and certain success; one bird was the active follower, while the other remained in reserve, at the distance of forty or fifty yards. If the hare, by a sudden turn, freed himself from his most pressing enemy, the second bird instantly took up the chase, and thus prevented the victim from having a moment's respite. He had remarked the eagles also while they were engaged in fishing. They chose a small ford upon the rivulet which connects Glencullen with Glandullah, and posted on either side, waited patiently for the salmon to pass over. Their watch was never fruitless—and many a salmon, in its transit from the sea to the lake, was transferred from its native element to the wild aërie in the Alpine cliff that beetles over the romantic waters of Glencullen.—?

The burning sands of hot climates, even at Carsfield, at the Cape of Good Hope, which are so arid and scorched that no water can be extracted from them, are the soil in which the most succulent vegetables of which we have any knowledge flourish. So deleterious, indeed, is a wet season to their growth, that they are destroyed by it. There are also various tribes of vegetables that are destitute of roots, and which can only be supported and nourished by the air, and the moisture which it contains. It is stated that the aërial Epidendron, (*Epidendron flos aëris,*) which is a native of Java, is plucked up by the inhabitants, on account of the elegance of its leaves, the beauty of its flowers, and the exquisite odour it diffuses, and suspended by a silken cord from the ceiling of their apartments, where it continues from year to year to put forth new leaves, to display new blossoms, and exhale new fragrance, though fed only by the air.—?

ON ECHOES. II.

The brief outline which we have given of the nature and cause of Echoes, will, we hope, enable our readers to understand the reason why Echoes are so different in their character and frequency, according to the circumstances under which they are produced.

If a person standing in a narrow passage, were to throw a ball forcibly against the wall, it would rebound against the opposite wall, be again reflected from thence, and perhaps a third and a fourth time, be reflected from side to side before it fell to the ground. The number of times that these rebounds would occur, would depend on two circumstances: first, the width of the passage; and second, the force with which the ball is thrown: of the truth of this any one can easily convince himself by experiment. Again, if a schoolboy strikes his marble against the side of a stone, and there be another projecting stone opposite to the first, the marble will rebound from one surface to the other and back again, and this would occur perhaps several times.

Now exactly the same thing would occur, if there were a perpendicular wall, or rock, *behind* a person who utters a sound as well as one *before* him: the sound of his voice would be reflected from one surface (in the manner which we illustrated by reference to a racket-ball), and travelling backwards, would strike against the opposite surface, situated behind him, from which, being reflected again, it would once more travel to the opposite wall, and so on until the sound became too weak to travel further. In every backward journey it would strike upon the ear of the speaker, and as many Echoes as he could appreciate separately, so many times has the sound travelled to and fro.

This then is the cause of the oft-repeated Echoes which are heard of in different parts of the world. The two opposite walls of a building, or two perpendicular rocks, one on each side of a ravine or mountain-pass, or two lofty buildings separated by a wide space, may all, if they be parallel to each other, become the home of Echo: a sound will be reflected from one to the other: and if the surfaces be exactly opposite to each other, the reflexions will be numerous: and, as Dr. Arnott observes, a sound produced between them is repeated often, "playing like a shuttlecock between them, but becoming more faint each time, until it is heard no more. In some situations, particularly when the sound plays thus above the smooth surface of water, a pistol-shot may be counted forty times."

Addison mentions an Echo near Milan which will return the sound of a pistol, fifty-six times.

Lord Bacon describes an Echo in the church of Pont-Charenton, on the River Seine, in which he discovered the inability of an Echo to return the letter S, for having pronounced the word SATAN, the Echo replied VA-T-EN, which in French means "Be off" or "Go away." From this circumstance the French priests concluded that some protecting angel prevented the walls of the sacred building from pronouncing the name of *Satan.*

The Rev. Gilbert White, in his *Natural History of Selborne,* has devoted one of his charming letters (the 34th.) to a description of an Echo at Selborne, in which however there is nothing remarkable, except in the manner in which it is treated.

On the banks of the Rhine, near Lurley, there is a remarkable Echo, produced by the singular disposition of the two elevated banks of the river following parallel lines in a serpentine direction, and thus presenting many reflecting surfaces to the rays of sound. When travellers pass near this spot it is usual for the postilions to sound their horns. The musical sounds

are soon repeated clearly and distinctly, and again a second, a third, and even a fourth time, as if from a progressively-increasing distance, until they fade away. When this experiment is performed in a boat placed midway between the two banks, the repetitions of the sound are more numerous.

There is a legend connected with this Echo, at which, we are happy to say, the correct views of modern science, and its salutary effects on the mind, now enable us to smile. The legend informs us "that a beautiful nymph resided on the rock of Lurley, which overshadows a dangerous eddy; and often when the amazed boatmen sailed through the stream, listening to the mysterious voices around him, his bark was drawn within the Vortex, and he was left to perish under the dwelling of the siren. The reports of her beauty and the cruelty of her disposition, attracted the attention of the youthful son of the Count Palatine of a neighbouring country; and he determined on seeing her, and carrying her captive to his father's court. But his fate was sad; for on arriving, escorted by a few followers, in the troubled waters of Lurley, his boat whirled round and disappeared. Grieved at the loss of his son, the Count sent a small band to seize the relentless damsel, and they were about to do so; when a sudden hurricane swelled the stream, the waves crested with foam, rose to the top of the rock," and encompassing the lovely Undine *, saved her from the rude grasp of man, and carried her to the realm of her fathers. Her voice is still heard, returning the sounds of sadness and of mirth, but her form is no longer seen on the rocks of Lurley."

These instances are sufficiently interesting; but a remarkable addition to the effect of Echo is produced, when the surface from which the reflection occurs is concave or hollow. Here again we shall find a racket-ball useful as an illustration:—suppose a room, or a piece of ground, were perfectly circular, and surrounded by a high wall; if two players were within the space, and one of them occupied exactly the centre, wherever the latter one struck the ball, it would invariably return to him again; whichever part of the wall he directed the ball to, he would always fail in making it rebound to his companion (except when he made the ball pass over the head of the latter towards the wall), and the latter would find himself deprived of his share of play. The reason of this is, that no part of the wall slopes away from the person who occupies the centre of the room, as every part of it is equally distant from him (that being one of the properties of every circle).

If now, instead of a ball, the sound of his voice were the object reflected from the circular wall, all the reflection would return exactly to the spot occupied by him; and the multiplicity of these reflections or Echoes, would produce an extraordinary loudness of sound to his ear. But any other person in the room would be in the condition of the inactive racket-player, he would to be sure hear the sound of his neighbour's voice coming direct to him, but he would not hear one of the Echoes. Were it possible for the floor and ceiling of a room to be constructed as a hollow globe, that is, equally concave above, around, and below; a person placed in the centre would hear his own voice with most stunning effect, as an Echo would come from every conceivable point of the surface.

The shape of an egg is familiar to all our readers, and it is easy to conceive a flat surface, having the same shape as the outline of the egg: this is called an oval, or elliptical surface, and may be considered as a circle flattened on two of its sides. Many of our young friends are doubtless acquainted with the mode of forming an oval from pieces of two different-sized circles; and that, as well as simple inspection will show, the centre of the oval is not equi-disant from every part of the boundary. If, therefore, a room were of an oval shape, and a person standing in the middle were to throw a ball against the wall, it would not rebound to the spot occupied by him, except from the two points nearest, and the two points farthest from him; if he cast the ball in any other direction, it would rebound to some other part of the oval space. But it is remarkable, that a perfect oval contains two spots, both of which possess many of the properties which belong only to one centre. If two persons were standing, one on each spot, and one of them were to strike the ball, it would invariably rebound towards the other player: by no method of throwing the ball could he make it rebound to himself again, except from two points; viz., the one nearest to, and the one farthest from himself.

Let us now, as before, apply this reasoning to the reflection of sound. If the person situate at one of those favoured spots were to produce a sound, instead of throwing a ball; the Echoes would all congregate togards the other spot, while he himself would hear none of them. This singular effect of concentration after reflection would be beautifully shown, if we had an oval room, the wall of which was covered with looking-glass or polished metal. If a candle were placed in one of those centres, all the reflections, except two, of its light would assemble together at the other centre, so that a great brilliancy would be caused at that point, while the person who held the candle would see but two images of it in the polished surface. It is from this circumstance that the two centres have acquired the name of *foci*, (or fire-places,) because wherever an accumulation of light exists, great heat exists also. In proportion as the oval approaches to a circular form, the two foci are nearer to each other; but if it be a *long* oval, they are further asunder, and approach nearest to the small ends of the oval.

If our readers have been able to follow this brief description of the mode in which Echoes accumulate, where the reflection takes place at a curved surface, they will be at no loss to understand the cause of some remarkable instances of Echo, which we shall adduce. There are on each side of Westminster Bridge several arched recesses, (intended as resting-places,) and placed exactly opposite to each other, two and two. If in the stilly calmness of night, two persons place themselves in two opposite recesses (one in each), with their backs towards each other, and one of them whispers, the other will hear distinctly what he says. We may, without much impropriety, call those two recesses the two small ends of an oval, and that the whisperer is situated in one focus, and the listener in the other focus of that oval, and that the multiplied reflection produces a sound as loud as if the listener's ear were close to the speaker.

Great as this distance seems to be, it is much less than the diameter of the dome of St. Paul's, and yet a whisper uttered in the interior gallery of that stupendous dome is distinctly audible at the other side: this is due to two circumstances,—1st, the whisper is reflected from side to side, and,—2nd, it is carried round the circular wall, and, therefore, not dissipated as it would be in the open air; for it is desirable here to observe, that if sound be prevented from spreading in one direction it will appear more

* A German term for a sea-nymph, or water-nymph. There is a wild and beautiful tale, well known to the German Student, entitled "*Undine*," written by the Baron de la Motte Fouqué.

intense in another direction. Acting upon this principle, (although it is very doubtful whether he could explain the cause of it,) the itinerant dealer in the public streets holds his open hand at the side of his mouth, while calling his wares for sale, in order that by acting as a wall it may carry the sound in any particular direction.

Mention is made of a clergyman in the country, who caused a concave surface, or sounding-board, to be placed behind him, in order that the sound of his voice might, after reflection from that surface, be carried to the remote end of his church; it was found, however, that his position in the pulpit was in the *focus* of that curved surface, and that the echoes returned to his own ear with a stunning effect, and it was found necessary to remove the sounding-board.

Mention has been made more than once, of situations where the noise produced by a waterfall has been concentrated by the concave surface of a neighbouring cave, that a person accidentally bringing his ear into the focus, is suddenly astonished at the tremendous and apparently unaccountable roar of many waters. It is not an uncommon trick to place a chair in the cave in the focus, so as to invite the wearied stranger, who often exchanges his fatigue for perplexed astonishment.

The expanded sail of a ship, made concave by a gentle breeze, is often a good condenser of sound. It is related by Dr. Arnott, that a ship sailing along the coast of Brazil, far out of sight of land, the persons walking on deck, when passing a particular spot, heard very distinctly, during an hour or two, the sound of bells, varying as in human rejoicings. All on board came to listen, and were convinced, but the phenomenon was most mysterious. Months afterwards it was ascertained, that at the time of observation, the bells of the city of St. Salvador, on the Brazilian coast, had been ringing on the occasion of a festival; their sound, therefore, favoured by a gentle wind, had travelled over perhaps 100 miles of smooth water, and had been brought to a focus by the concave sail in the particular situation on the deck when it was listened to.

Before concluding, we may mention that Echoes will enable us to ascertain, with tolerable accuracy, the distance of an echoing surface from the person who produces the sound.

We have before stated, that sound travels at the rate of 1125 feet per second; if, therefore, a person utters a sound, and he hears its echo one second of time after the sound is produced, he will know that the sound has travelled 1125 feet, that is 562½ to the echoing surface, and the same distanee back again.

The greatest number of distinct sounds that the ear can appreciate in one second, is about ten or twelve; beyond that number, they all seem to blend into one. If, therefore, a person were to utter ten syllables, or produce ten notes on a musical instrument in a second, and he could hear the Echo of the whole of these ten, he would know that the Echoing surface is not less than 562½ feet from him: but if the Echo of the first notes reached him while he was producing the sixth, that would indicate a distance of only 281¼ feet, the half of the former. If the Echo of a single sound returned to him about 2½ seconds after the sound was uttered, he would be able to calculate that the Echoing surface was about half a mile distant, and so of any other interval.

When Echoes are distinctly audible, it will generally be found that the distance between the reflecting surface and the ear of the observer, is not less than seventy or eighty feet; so that the sound, before it returns to the ear, travels not less than 140 or 160 feet. Echoes are constantly occuring in all our apartments, and the reason that we do not hear them is, that as sound travels so quickly, it allows no appreciable interval of time between its motion from the mouth to the walls, and back again to the ear of the speaker, so that the original sound and its Echo become so blended as to appear only one sound. In very large rooms however, such as music-rooms, the separation of the original, and of the reflected sound, is often painfully evident. The best remedy appears to be to break the surface by mouldings and ornaments of various kinds.

The reason why thunder sometimes produces a sudden violent shock, and at other times, a rolling rumbling sound, is that in the latter case the original noise is echoed from cloud to cloud, and from cloud to earth, and that if large masses of cloud be situated at different distances from the hearer, he will hear a rapid succession of Echoes, those reaching him first which have the shortest distance to travel, and thus a lengthened sound is heard instead of a short and sudden sound.

It were much to be wished, that the timorous and superstitious feeling with which thunder is often regarded by the uneducated, were replaced by a more just, and cheerful tone of mind. Neither pure religion, nor a common course of reasoning, will justify the terror and mental dread so often experienced on the occasion. It should be regarded as one of those grand and sublime manifestations of the system by which the great Architect governs the worlds which he has created, and not merely as a means of striking terror into the hearts of his creatures. There is an inward monitor more powerful than thunder, which can better perform that office when necessary.

T.

THE laugh of the hyena greatly resembles that of a maniac, and has a startling effect as it steals through the still night, even under our windows, which it approaches in search of food. The power of imitation given to these animals is very extraordinary; for they not only cry like the quadruped whom they wish to lure within their reach, but they even seem to utter human sounds. The commandant of a fortress on the western coast of Africa assured a lady, that for several evenings he had been disturbed at his dinner-hour by the laughing and screaming of the native women, who passed under the walls in search of water. He sent his serjeant to them, who desired that they might take some other path, and they promised to obey. The next evening, however, the noise was heard again, which highly irritated the commandant, and he desired the serjeant to lie in ambush on the third evening, and rushing suddenly out on them, with a few soldiers, secure the women, and bring them to him in the fortress. The men took their station as ordered, the laughing recommenced, and out they sallied, when to their great astonishment, they only saw three hyenas standing in the path which had been frequented by the women, and so well counterfeiting their voices, that they could not have been detected but by sight. These hyenas are not very formidable, and will, at any time, rather fly from, than attack a human being.

This species of the hyena are very common in American menageries, but they are so subdued and powerless, from constant confinement, and so fearfully watchful of the keeper's eye, that they never manifest, as prisoners, any of the peculiar imitative sounds which characterize them in their native regions.

WHEN the garden in the rising year begins to array itself in gold and purple—in youthful brilliancy, all nature joins in the scene of gladness. 'Twere ungrateful then for a man to stand alone in sullen apathy.—MAUND.

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